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THE next Convention of the American Institute of Architects, which will be the twentieth since the foundation of the Institute, is to be held in New York city on the first, second and third days of December next. Messrs. E. T. Littell, A. J. Bloor and O. P. Hatfield have been appointed a Committee of Arrangements, and a detailed programme of the meetings is in course of preparations. Meanwhile the Committee earnestly requests those who will be able to be present at the meetings to notify the Secretary, Mr. Geo. C. Mason, Newport, R. I., as soon as possible, so that provision may be made for their comfort, and it desires also to secure the coöperation of the profession in proposing subjects for discussion, and in preparing papers of professional interest, together with drawings, sketches and models for exhibition at the meetings. New York, being, so to speak, the central point of the United States, has always been a popular place for Conventions of the Institute, and it is to be expected that there will be a full attendance, and as matters affecting the profession, if any action is to be taken upon them, need to be discussed and decided by as large a number of representatives as possible, it is particularly desirable that the vital questions which must very soon be dealt with by architects here, as they already have been abroad, should be placed at the head of the list of subjects to be discussed this year. The Western Association of Architects has done good service to the profession in attacking some of these questions with both zeal and discretion, and, although is is proper enough for the older body to move more slowly, it is time for it to give authoritative expression to the general feeling in favor of a more satisfactory code of professional ethics. So far as its strength as a representative body is concerned, the Institute is better able than ever to secure the respectful attention of the public to its opinions. During the past two or three years its growth in numbers, although quiet, has been very rapid. The limit of seventy Fellows, which was thought not long ago to provide ample margin for the additions of many years, has been far exceeded, and the newer members, we are glad to say, are nearly all residents of the Western States. The element of enthusiasm and enterprise which these new members may be expected to introduce into the deliberations of the Convention cannot fail to be of great value, and it is to be hoped that nothing may prevent a large proportion of them from attending the meetings.

ONE of our correspondents asked the other day for information about the care and preservation of bronze statues, fountains and other decorations, which, as he says, are getting to be much more numerous in this country than they were a few years ago. To tell the truth, a very large part of the fountains and statues in this country, which those who subscribed money to pay for them imagine to be of bronze, are made of cast-iron, colored to imitate the more valuable metal either by means of oil heated on the surface, or by some sort of paint or varnish, while many more are of cast-zinc, disguised in a similar way. Concerning the methods of preserving the patina on works of art of this sort we are unable to give any advice, except to recommend that a judicious house-painter be commissioned to keep watch of the sculptures, and touch them up occasionally, in time to prevent oxidation from getting too firm a hold upon them. With the much rarer objects which are made of real bronze less care is necessary, as there is no danger of their rusting away, but the effect of age and weathering on them is not always so satisfactory as it might be. The so-called antique bronze, which contains nothing but copper and tin, in the proportion of eight parts of the former to two of the latter, acquires by weathering a beautiful green coating, or patina, the production of which may be considerably hastened by oiling the statue occasionally. Modern bronzes, however, are apt to contain zinc, and this impurity prevents the formation of the green patina, and in time produces a disagreeable-looking black rust. Efforts have been made to remedy this in the case of statues made of bad metal, but we think that they have not yet been successful. A great deal might, it would seem, be done in the way of improving real bronze work by architects or other persons of influence. The Japanese and Chinese, for instance, make a bronze of a splendid black color out of eighty parts of copper, ten of lead, four of tin and two of zinc, the remaining four parts in one hundred consisting of iron, nickel, silver, gold and arsenic, perhaps present as impurities in the original ores. This bronze, the beautiful color and texture of which are well known, the Orientals inlay most effectively on a small scale with gold, silver, copper and brass, and there is no reason why the same thing should not be done on a large scale, using, perhaps, instead of gold the gold-colored aluminium bronze, which is not extremely costly, and preserves its brilliancy indefinitely. Mere surface coloring of bronze is easily effected by exposing it to the action of sulphur, or of various metallic sulphides, particularly those of antimony and arsenic, which are applied in solution in ammonia. With these, tints varying from red to steel-blue and black can be obtained, and the colored film is tolerably permanent, although it may in most cases be removed by strong ammonia. Bronzes of this sort, as well as those of zinc, or, as it is often politely called, "white bronze," or of cast-iron, must be cleaned, if they become dirty, with a good deal of circumspection, or the "bronze" will be removed, but articles of real metal, whether covered with patina or not, may be scrubbed with potash, dissolved in water, which removes soot, grease and organic substances without injuring either the metal or its handsome oxidized surface.

LA SEMAINE DES CONSTRUCTEURS, among the other excellent things which it offers to its readers, publishes from time to time what it calls "Consultations Techniques," upon various questions of professional interest. One of these, which appeared recently, was devoted to certain properties of plaster-of-Paris, and in the course of it several observations were made which are of considerable interest to those who use that material. The immediate occasion of the discussion was the experience of one of the subscribers of the journal, an architect in Paris, who was employed to direct some repairs and alterations in a house at Montmartre. The rear wall of the house, as is often the case in Paris, was of half-timber work, consisting of a wooden frame filled in with rubble, and the whole plastered on the outside. In repairing this the old mortar was cleaned off, and a new coat, made, as such coats usually are in the city, of plaster-of-Paris, was put on; and at the same time the new apartments in the building were plastered, and cornices run, in the same material. After waiting two months for the interior work to dry, and four months for the outside work, the plaster was painted. Some six months later, after the work had been finished and approved, the exterior plastering was found to be so porous as to allow rain to beat through it, and to be cracked in all directions, while the interior plastering proved to be so soft that it could be easily scratched away with the nail. The contractors, on being applied to for an explanation of this phenomenon, gave the usual diversity of reasons. One thought that the plaster had been mixed with too much water; another denied this, and said that it was properly mixed, but had been insuffi-

ciently calcined; while a third claimed that the burning and the mixing were well done, but that the stone from which it was originally made was bad. The contractor who did the work maintained that the plaster was of excellent quality, but that the modern plaster, calcined with coal, was inferior to that used by our ancestors, which was calcined with wood; moreover, he claimed that it was well known that an old, half-timbered wall, on being freshly plastered, underwent certain contortions, which tended to crack the new plastering, while the incipient decay which lurked in the ancient timbers infected the plaster and made it grow soft; and as to the interior work, the painter had, he thought, injured the plastering in sand-papering it, after the successive coats of paint, to say nothing of the fact that by finishing the rooms with a gloss, although he saved himself the expense of the flatting coat, he made all irregularities or defects much more visible than they would be in rooms painted in the usual way. These explanations, which will amuse architects, most of whom have listened to long strings of similar ones, seem to have made a certain impression on the owner, who finally compromised with the contractors, by requiring the mason to pay the value of the exterior plastering, which was applied toward the cost of covering it with metallic shingles; while the painter went over the interior work with putty, filling up the cracks and holes, and re-painting. The architect, who did not feel called upon to share in these labors, was dismissed in disgrace, for having been so careless in superintending the work as to allow bad plaster to be used.

As it happened, however, instead of neglecting his work, he had been so careful as to test the plaster brought to the building, by taking some of it to his house and mixing it with water, which, in his hands, gave an excellent mortar. Unable, therefore, to understand the real cause of the softening of the work at the building, he applied to *La Semaine* for an explanation more satisfactory than any of those advanced by the contractors. M. Detain, who seems to direct this portion of the journal, furnished him with this by observing that the change in the condition of the plastering seemed to be rather the result of using it too fresh than of any defect in the burning or in the quality of the original stone. According to him, the ancient practice, by which the calcined gypsum rock was laboriously pounded to powder at the kiln, is now superseded by much more rapid processes, so that the rock, often calcined, to save time, at a high heat, is taken from the kiln and thrown, while still hot, into a mill, from which it issues, still warm, in powder ready for use, which is packed in bags, and often sold and delivered at the place where it is to be used before it has quite lost the heat of the kiln. When plaster as fresh as this is mixed with water, it sets with great energy, and with the evolution of much heat, but on cooling and drying the mass shrinks, softens, cracks in all directions, and becomes weak and disposed to crumble. To guard against this effect, which is as serious with good plaster as with bad, it is necessary to make sure that the material is properly cooled, leaving it, if there is any doubt on the subject, exposed to the air for several days before using. Unfortunately in small establishments there is often no room to store the plaster, and it must be thrown into the mixing-pen as soon as it arrives at the building, for want of any other place to put it; so that the safest course is to make sure that it has been kept on hand for several days or weeks at the manufactory.

The *Builder* gives an account of a paper read before the British Association last month, by Mr. Conrad W. Cook, describing a method for increasing the brilliancy of gas-lights by placing in them a solid mass of some refractory substance, which shines by incandescence. For some time a light of the kind has been produced by means of cylinders of magnesia, which are placed near a gas-jet, and the gas first lighted and then, when the cylinders have become hot, turned off, and then turned on without re-lighting. Under these conditions the gas, striking the incandescent magnesia, burns in its pores without smoke, but with an intense heat, raising the magnesia to a dazzling brilliancy, the light emitted from it being much greater than would be produced by the same amount of gas burning with a flame. The magnesia cylinders, however, seem to be rather unsatisfactory, and various substitutes have been proposed for them. One of these, which was described by Mr. Cook, has been patented by Dr. Carl Auer von Welsbach, of Vienna, and consists in the ash of cotton cloth, saturated with solutions of alkaline earths. The cloth is made into a hollow cylinder, and soaked in a liquid composed of solutions of zirconia and oxide of lanthenum, and, after drying, is burned. The organic portion is immediately destroyed, but the earthy ash retains its form, and, being very porous and incombustible, answers admirably as the refractory source of the light of incandescence. The cylinders are used just like the magnesia cylinders of the earlier lamps, and the light from them is said to be from two to three times as great as would be obtained by burning the same quantity of gas with a flame, while the cylinders last from eight hundred to one thousand hours in good condition for use. If the experiment has not been already made, we would suggest the trial for this purpose of cylinders made of magnesia and sawdust, after the method employed in manufacturing the porous terra-cotta so common with us. By varying the proportion and degree of fineness of the sawdust, almost any texture and amount of porosity might be obtained in the calcined cylinders, at the smallest possible expense, and, if desirable, lime, alumina or any other earth of difficult fusibility might be substituted for the magnesia.

The *Revue Industrielle* describes and illustrates a simple machine for making "wood wool," or, as we should call it, "excelsior," out of chips and refuse pieces of wood. The use of this sort of fibre, for filling mattresses, for bedding animals, for filtering liquids, and for packing, is now so universal that there is a constant demand for it, and the refuse pieces which encumber wood-working shops can be made into wool, and sold at a profit over the cost, while the usual mode of disposal, which consists in burning the chips under the boiler, simply gets rid of them by allowing them to replace about one-fifth their value of coal. The new machine, which promises to effect an important economy in wood-working shops, particularly in those where furniture is manufactured and packed, is provided with rollers, by which bits of any size or shape are seized and pushed under a plane, which takes off a shaving of a thickness regulated by a set-screw. This shaving, continuing its course, is then brought into contact with a row of blades, which divide it into filaments, of a width easily regulated, while the original block returns to the starting-point to be shaved again by the plane. With a single-acting machine a thousand pounds of fibre can be cut in a day, and the product can be nearly doubled, with little increased expenditure of power, by arranging the machine with a double-acting set of planes. At present prices in France the material can be produced at a cost of four-tenths of a cent per pound, and sells readily at one cent a pound or more, according to the market. It does not appear whether the American fashion of using the wood fibre instead of hair in plastering mortar has yet been introduced in Europe, but with us a large amount would probably be consumed in this way, and a good deal more might with advantage be used for oiling and rubbing, in place of cotton waste, which costs ten times as much, and is said to be no better.

The *Sanitary Engineer* reports perhaps the worst case of ignorant specifying for plumber's work that has ever been recorded. According to a correspondent who writes from Nebraska, and signs himself "Plumber," the architect of a certain public building erected in Kansas not long ago ordered, in his specification for the building, that all the waste pipes from the different fixtures in the building, including water-closets, urinals and wash-basins, should be carried to the basement and entered into a sewer-pipe, which should be laid in the basement to receive them, and should "conduct same to cistern outside of building." The same sewer-pipe was also required to be prepared to receive rain-water from the roof, and another clause in the specification provided that a tank, for furnishing water to the house, should be built in the upper story, and "supplied with water from the above-mentioned cistern." The *Sanitary Engineer* very properly remarks that "in all probability the so-called architect who was responsible for this stupidly dangerous specification is no more entitled to be considered an architect than many men who pretend to do plumbing work are entitled to be considered plumbers," but we do not see how this circumstance affects the conclusions to be drawn from the story as to the care with which the selection of architects for public buildings is made in Kansas.

EARLY SETTLER MEMORIALS.[1] — III.

Pilgrim Hall, Plymouth, Mass.

PURITANS GOING TO CHURCH.

THE most popularly attractive illustration of the danger of Indian attacks in early settler life in America, is George Boughton's picture of "Puritans Going to Church." The picture does not depend entirely upon its name for an explanation of its meaning. At the first glance, the intention of the artist is understood, and the impression the picture is made to produce, is at once felt by the observer — and the first glance is about the extent of attention or study that is given to works of this kind. The sympathy is awakened, and the mind trusts to history for a confirmation of the true value of the picture as a delineation, and of its merits as a logical representation of the subject.

A slight analysis of this picture is sufficient to show that the artist considered the elements of danger, and the means of defense, if he did not arrange them in a perfectly harmonious proportion. The woods and underbrush in the near background afford an ample hiding-place for the evil-disposed Indians to make a severe, if not overwhelming attack upon the devotional procession, and from a point from which the innocent Puritans are evidently not expecting one. It is rather from the spectator that danger is apprehended, as the only indication of expected surprise, mild though it be, is seen in the faces of two men and the girl, all three looking out of the picture.

Puritans going to Church.[2]

The grouping of the figures so closely together is happily calculated to assist the young and inexperienced members of an attacking party in the uncertain aim of their arrows.

The elements of danger, so far as good accommodations for the Indians are concerned, are perfect in this picture. They are, in fact, unquestionably, too perfect, for there is not the shadow of a savage to be seen anywhere. The absence of "the Indian foe," also serves a double purpose. It shows that the object of the picture is attained by the use of accessories, while the vital reason of its existence remains in the dusky seclusion of his wigwam. It is a clear case of picturesque delusion; of aggravated emotional results produced by partially non-existent causes. And yet there is a reason for this that we shall discover as we go along, for it will be remembered that this picture is entitled, "Puritans Going to Church," yet not a soul of these fourteen forlorn and self-abnegating creatures budges an inch. Every one of the fourteen feet that are visible, are as immovably fixed upon the surface of the snow, as though frozen by the heartless rigors of a New England winter. And the bodies are also stationary, none has ever moved, nor will ever move. There they are set up like so many manikins, to scare away the savages.

The extreme care with which each foot is painted, the absence of foot-marks on the snow, the uncovered hands and warmly-clothed bodies, the dreary and well-painted wintry landscape, excite sympathy for these unfortunates, who turn a good piece of painting into a wax-figure show.

[1] Continued from page 156, No. 562.

[2] By the courtesy of Messrs. Knoedler & Co. we are allowed to reproduce Boughton's picture in outline.

STANDISH MEMORIAL.[3]

The Standish monument at Duxbury, Mass., seems to have been completely forgotten, even by those who were formerly connected with it, for it was only after repeated inquiries that the writer could find out anything about it. It is probably the most unfortunate monument scheme ever undertaken in the United States, with the exception of that to the memory of the Father of his Country, at Washington, D. C.

"The Standish Memorial Association," including in its membership a large number of the foremost citizens of New England, was formed at Duxbury, Mass., December 21, 1870. Its object was the erection of "a suitable and proper memorial monument, obelisk, or tablet, to the memory of Captain Miles Standish, on or near Captain's Hill, Duxbury, Massachusetts."

The spot finally chosen for the monument was Captain's Hill, an elevation within the limits of the old Standish farm in Duxbury, where the Captain lived, died, and is believed to have been buried. "The farm was given him by the Colony about 1630, and remained in the family until the middle of the last century. The hill is one hundred and eighty feet high, and overlooks Plymouth and Duxbury bays, and is now much used as a sighting point by navigators entering Massachusetts Bay. When the shaft is up, it will be most useful to the coast survey, as well as to navigators."

The height of the monument was intended to be one hundred and fifty feet, including "a probable statue in bronze, of the Captain, twelve feet high, which will be a truthful likeness." The octagonal base, twenty feet in diameter, rises to the height of twenty feet, thence to the top "it will be perfectly round." The whole structure was "to be built of irregular rough granite blocks, and plastered on the inside." The top of the monument was to be reached by a stairway running around between the inside the monument and outside of a "brick cone" that extended from the base to the summit in the centre. The contemplated cost of the completed structure was estimated to be from $50,000 to $80,000.

Work on the monument ceased in 1874, leaving it in its present condition, at the height of seventy feet. About $23,000 have thus far been expended. It is "expected that next year will see it rise to the height of one hundred feet. Five acres on the top of the hill were given for the site of the monument by Stephen M. Allen, Esq., of Duxbury. The ground was consecrated to its intended purpose on the 17th of August, 1871, and the corner-stone was laid on the 7th of October, 1872. The design was furnished by Mr. Alden Frink, a Boston architect.

These are all the facts, usefully dry, that we have been able to gather concerning the Pilgrim Captain's Memorial.

The design, though looking more like an enlarged pepper-box than anything else, is quite as much a work of art as the large majority of similar objects. It is really an unfinished empty pepper-box, whose historic, intellectual and artistic value is fully illustrated on one of the keystones of the arch of the doorway, where the abbreviation of the name of a New England State is engraved thus — M. E.

It should be added that the projectors of this enterprise made no mention of an intention to erect either a work of art, or "the greatest monument in the world."

PILGRIM HALL, PLYMOUTH,

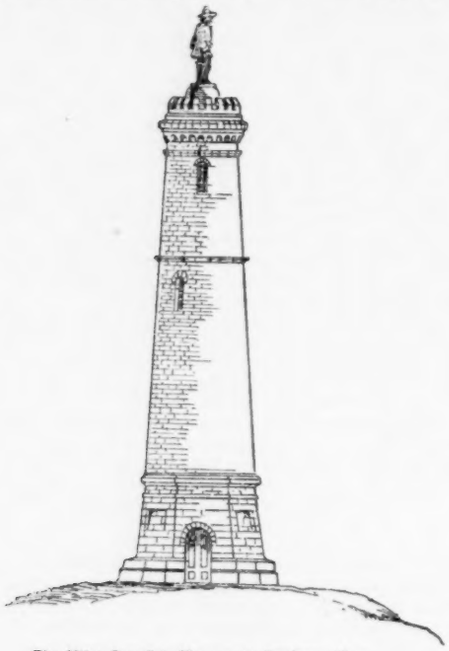
was erected by the Pilgrim Society, in 1824, as a monumental hall to the memory of the Pilgrims. It contains memorials of the Pilgrims, and the town library.

"The iron railing in front of the Hall, enclosing a part of the 'Plymouth Rock,' has inscribed upon it the names of those who signed the ever-memorable Compact on board the Mayflower, in Cape Cod harbor.

"In the year 1775, the people of Plymouth, to render available the

[3] A meeting of the Standish Monument Association was held Wednesday, at the room of the Webster Historical Society, Old South. It was voted to go on with the erection of the monument on Captain's Hill, Duxbury, so that, if possible, it may be finished in 1887, the two hundred and fiftieth anniversary of the charter of the town. It is now seventy-two-and-a-half feet high, and it is to be carried up to one hundred and ten feet besides the statue. One gentleman has offered to contribute $1,000 toward the finishing. It will be one of the largest private memorial statues in the United States, and has cost so far $25,000. — *Boston Advertiser, July* 30.

patriotic associations connected with the rock, undertook its removal to the town square, with the intention of placing over it a liberty pole, as an incitement to vigorous efforts in the approaching revolutionary struggle, and to quicken the zeal of such persons as hesitated to join the standard of independence. In this attempt at the removal, the rock split asunder, to the great surprise of the people present;



The Miles Standish Monument, Duxbury, Mass.

and by some it was construed into a favorable omen, indicating the final separation of the colony from the mother country. This unexpected incident led to some hesitation among the excited group assembled, and the conclusion was to leave the lower part of the rock in its original bed, and remove the other part to the town square, where the far-famed liberty pole was speedily erected over it, on which an appropriate poetic effusion of some ardent son of liberty was placed, urging the citizens to renewed effort in the cause of their country."

It remained at the foot of the liberty pole until 1834, when it was removed to its present resting-place.

CANOPY OVER PLYMOUTH ROCK.

The memorial canopy over the "Rock" upon which the forefathers landed is thirty feet high and fifteen square, and built of granite. "It is surmounted by a scallop shell, indicative of the Pilgrim character of the enterprise of the Fathers." In the chamber formed by the upper part of the structure are deposited the remains of some of the pilgrims who died the first year after the landing.

CUSHMAN MONUMENT.

This monument was erected by the descendants of Robert Cushman, a fellow-exile with the pilgrims in Holland, afterwards their chief agent in England, and finally a resident of Plymouth from 1621, until his death in 1625. It was consecrated July 16, 1858, to the memory of Robert, and his son, Thomas Cushman, who was "ruling elder of the first church in Plymouth for more than forty-two years." It is made of Quincy granite and is twenty-six feet high. It stands on the spot where Elder Cushman was buried in 1691.

The original tablet, of slate, placed at the head of his grave in 1715, was brought from England, and is now deposited in the museum of the Plymouth Society of Plymouth. It bears the following record:

HERE LYETH BURIED Y^e^ BODY
OF THAT PRECIOUS SERVANT OF
GOD M^r^ THOMAS CUSHMAN, WHO
AFTER HE HAD SERVED HIS
GENERATION ACCORDING TO
THE WILL OF GOD, AND
PARTICULARLY THE CHURCH OF
PLYMOUTH FOR MANY YEARS IN
THE OFFICE OF RULING ELDER,
FELL ASLEEP IN JESUS DECEM^r^.
Y^e^ 10, 1691, & IN Y^e^
84 YEAR OF HIS AGE.

BURYING HILL, PLYMOUTH.

"On the brow of one of the highest eminences in the old town of Plymouth," says Dr. Shurtleff, "rest the mortal parts of many of the Pilgrim Forefathers — too many of them, alas! without even a humble gravestone to mark the spot of their sepulture. The turf, in gently-rising mounds, indicates what tradition alone besides, in the absence of all written testimony, makes more certain, that there the fathers are sleeping from their labors.

"When the modern pilgrim finds his way to Plymouth, and, with filial veneration, directs his step to the sacred spot where rest the fathers of New England, he is peculiarly struck with the remarkable objects which are presented to his view. When he has ascended the high hill, and looks around upon the innumerable gravestones which affection has placed as the last tribute to the memory of departed parents, relatives and friends, he seeks in vain for an ancient memorial to mark the graves of the '*Mayflower*' Pilgrims of 1620. In vain he inquires for the graves of those who came in the '*Fortune*' in 1621, in vain for those of the '*Ann*' and '*Little James*' in 1623. In vain he asks, in vain he seeks. Of all these, Thomas Cushman alone of the '*Fortune*' and Thomas Clark alone of the '*Ann*' are remembered by tablets. Their graves alone were surely designated by gravestones on Burying Hill. One of the old comers, Phineas Pratt, was similarly remembered in the old burial-ground in Charlestown. Uncertain tradition, however, has attempted to point out the burial-places of a few others, and modern memorials have been erected to their memory.

"In an elevated position in one part of this field of the dead may be seen the shaft erected in memory of William Bradford, not only emphatically the governor of the Plymouth colony, but the faithful chronicler of the Pilgrims, his associates in the great enterprise. In another direction is the large slab commemorating the life and services of the venerable John Howland; and still, in another portion of the field, the monument which the filial regard of the Cushman family has raised over the grave of their pious ancestor, the excellent Elder. These, indeed, are modern erections, but not the less honorable. . . .

"Close beside the green hillock subsequently selected as the grave-lot of the venerable Elder, the fathers, in earlier days, built their humble sanctuary — small, indeed, but then the only one in New England, and that one their own, and untrammeled by the yoke of anti-Christian bondage. . . .

"Here, still earlier, stood the scanty fortification of the peaceful little band of Puritans — a simple platform, with slender roof and unpretending battlements, hewn from native forests. Slight as was the structure, it served well to protect them from the sudden inroads of savage beasts, and as a defence against the hostile attacks of the more wily and barbarous Indian foe. It served another and a holier purpose — it was the place of prayer, the place of worship — the first rudiments of the first building of the first church of the Pilgrim Fathers.

"While standing within this ancient cemetery, the stranger is forcibly struck with the appearance of the large number of monumental tablets and burial-mounds which he notices on all sides, compared with the smaller number of buildings in the village at its base — that the dwellings of the dead far outnumber the dwellings of the living. The immediate scene presents a vast assemblage of the past and a more limited population of the present — the quiet remains of other days above, and busy and bustling life of to-day below. Here is where the forefathers lie with their children of more than two centuries, gathered together in family clusters, awaiting the call of the last great day. And where could they lie more appropriately than in the chosen land of their American pilgrimage?"

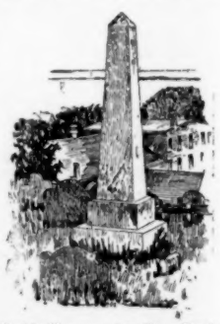
BRADFORD MONUMENT.

The marble obelisk in memory of Gov. William Bradford, the second governor of the colony, with its untranslatable Hebrew text, and its Latin inscription: "Do not basely relinquish what the Fathers with difficulty attained," was erected in 1825. The oldest stone on Burying Hill is that to the memory of Edward Gray (1681), one of the wealthiest men of the colony.

John Howland's grave-stone bears the following inscription:

"Here ended the pilgrimage of John Howland and Elizabeth, his wife. She was the daughter of Gov. Carver. They arrived in the Mayflower Dec., 1620. They had 4 sons and 6 daughters, from whom are descended a numerous posterity.

"1672, Feb. 23d. John Howland, of Plymouth, deceased. He lived to the age of 80 years. He was the last man that was left of those that came over in the ship called the Mayflower, that lived in Plymouth."



Marble Monument to Wm. Bradford, Second Governor of Plymouth Colony, Plymouth, Mass.

PLYMOUTH MONUMENT.

In an article published in this journal in July 1881, under the title of "Civic Monuments in New England," we spoke at length of the above structure. Since then a granite object, called by the ennobling name of "Education," and a bas-relief in marble, entitled, "Signing of the Social Compact in the Cabin of the Mayflower," have been added to it. They were the gifts of Roland Mather, Esquire, of Hartford, Conn. As in previous descriptions of this terrible pile of granite by those who caused its erection, so in the description of the statue of Education, the amount of material and the weight thereof, have been duly emphasized as the proper recommendations to respect for it as a commendable work. As an interesting and significant item in the history of this monument, and as a just illustration of its relation to art and the kind of intelligence that has been directly and successfully engaged in its erection, we give below a copy of an advertisement that is published on the back of a photograph of the upper part of the Statue of Faith:

"STATUE OF FAITH, FOR PLYMOUTH MONUMENT.

"The Statue of Faith, a part of which is here shown, crowns the

National Monument, being erected at Plymouth in honor of the Pilgrims. This statue is thirty-six feet high, and comprises the cubic contents of two hundred and sixteen life-size statues. It rests upon an octagon pedestal forty-five feet high, thus making the monument one of the grandest and most imposing of its kind in the world. She stands with her foot upon a portion of 'Plymouth Rock'; in her left hand she holds an open bible; with the right uplifted she points to heaven. Looking downward, as to those she is addressing, she seems to call them to trust in a higher power.

"The figure is the work of the Hallowell Granite Company, Hallowell, Maine, from their celebrated white granite. The work of quarrying the stone was begun in June, 1876.

"The blocks of granite of which it is composed, when taken from the quarry weighed more than four hundred tons. In its finished condition it is estimated to weigh two hundred tons. The process of making the figure, in which the skill of the most gifted sculptor was necessary, was one of great difficulty. The contract for cutting it was let to Joseph Archie, a Spaniard, who is probably one of the most skilful carvers and sculptors in the land. The time occupied in the execution of the work was one year, it being completed July 10, 1877. The upper portion of the figure was on exhibition at the yards of the Company for four days, and was visited by many thousands of people.

"Every person contributing $1 to the Monument Fund will receive this photograph and a steel engraving of the entire monument, including a view of Plymouth from the bay.

"Communications should be addressed to Rev. W. M. Harding, General and Financial Agent, 3 Tremont Row, Boston, Mass.

"Copyright 1877, by W. M. HARDING."

National Monument to the Forefathers, Plymouth, Mass.

For additional particulars concerning the size of this figure we copy from the back of a photograph showing the present condition of the monument. "The outstretched arm measures, from the shoulder to the elbow, ten feet, one and one-half inches; and from the elbow to the tip of the uplifted finger, nine feet nine inches. The head measures around, at the forehead, thirteen feet seven inches; from under the chin to the top of the head is fourteen feet, five inches. The points of the star upon the forehead are just one foot across. The length of the finger pointing upwards is two feet, one inch, and it measures one foot, eight and one-half inches around. The length of the nose is one foot, four inches."

It is estimated that $100,000 have been thus far expended on the monument. The statues of "Law" and "Freedom," with their accompanying bas-reliefs of "The Landing at Plymouth" and "The first Treaty with the Indians," are yet to be executed.

Judging from the persistent energy displayed in completing it to its present condition, the enormous increase of public preference for size and weight, as the all-sufficient qualities in the construction of monuments, the total indifference to the principles and facts of art, that characterize the great monuments of the world, the complete absence of respect or care for what really makes a monument, there seems to be no reason why this one will not be completed in due time, in accordance with its great character.

When it is remembered that the great monuments of the world were made by artists who were as eminent in their professions, and as great as men, as those who were concerned in the events which those structures commemorate; and as great as the statesmen, orators and poets who celebrate those events, it might seem to the critical observer that the granite-cutters who hewed out the National Monument to the Forefathers would not bear a satisfactory comparison. Between the artists who made the monument lately erected in Florence, in commemoration of Count Cavour, and those who made the Plymouth monument, there would seem to be something of a disparity. Those who made the former are known in France as men eminent in their professions; while the names of the authors of the latter are buried beyond mention under the hundreds of tons of merciless stone, by the enthusiastic care of a financial agent.

If the curious student of art and history should, on beholding this monument, and especially the view of "Faith" given in the illustration, call to mind the great Americans who have spoken, written and sung the fame and reverential remembrance of the Pilgrim Fathers, from 1820, when Daniel Webster spoke, to the present day, he might

say that, if this structure was an expression of American genius to be compared to those uttered by statesmen, orators and poets, there would need to be some additional recommendation of its merits beside the unlettered encomiums of a rustic photograph-vender and the startling announcement of the length of a nose. He might also ask if those men who have caused its erection were not amenable to a higher and more exacting tribunal than the impressive precincts of the Hallowell granite yard.

The Plymouth monument represents the most reprehensible methods that can be employed in such enterprises. "The practices and the productions of our sculptors, working at home or in Italy," are not more reprehensible, though some of them are undoubtedly more cunning and more adroitly conducted. The architects and workmen who have been connected with this monument are already forgotten, but it will stand for centuries as an expression of the taste and intelligence of the men who have been active in its construction. It has

received the sanction and approval of the most eminent citizens of the country. It will be regarded as their work and that of no others. Fortunately its situation is such that it will never be brought into critical comparison with the large monuments of the world that are known as works of art, and the American people will be spared the mortification that would then result.

It is interesting to read what was said at the time this monument was projected. The Hon. Richard Warren concluded his address, on the occasion of laying the corner-stone, with the assertion that "We are now about to lay the corner-stone of a structure grander than any of the kind the world has ever witnessed. . . ."

The Pilgrim almanac of 1860 says, in an article on the proposed monument, that "History will look in vain for a greater event to chronicle; art will never again for us have the opportunity or the occasion to embody themes so simply grand, so peculiarly significant. It is worthy, then, of all that art can offer as a testimony."

Hammatt Billings, the designer of the monument, wrote as follows: "The National Monument to the Forefathers, which is just about to be commenced under the auspices of the Pilgrim Society, is intended to be the grandest work of the kind in the world. Raised in commemoration of the great starting-point in our history, it is the idea to make it, as far as possible, worthy of the great event which it will record. In size it will be the greatest of modern works, and only equalled by those vast monuments of Egyptian power and grandeur which remain to us, the most wonderful triumphs of mere mechanical skill."

The difference between the proportions and general effect of the original design and the above enthusiastic words are not so unpleasant as that shown in the comparison of the original design with the present structure. Thomas Clark's gravestone has more art in it and is more interesting to the artist, than the great monument.

ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

THE CONVERSE MEMORIAL LIBRARY, MALDEN, MASS. MR. H. H. RICHARDSON, ARCHITECT.

[Gelatine Print issued only with the Imperial Edition.]

INTERIOR OF THE SAME.

[Gelatine Print, issued only with the Imperial Edition.]

STABLE FOR MR. H. G. HARWOOD, ESQ., NATICK, MASS. MR. W. FRANK HURD, ARCHITECT, BOSTON, MASS.

THIS stable, which will be completed this fall, is being built by day-work. It has Milford granite, split underpinning, and best pressed-brick, vaulted wall up to the Longmeadow stone belt under first-story windows. The second floor has mill framing, and the moulded panels between floor-timbers have hard-pine sheathing; also the walls above the brickwork. The stall portion and the driveway of carriage-room will have paving of pressed bricks on edge.

COMPETITIVE DESIGN FOR A $5,000-HOUSE, SUBMITTED BY "*Lawn Tennis.*"

MASONRY.	
Preliminary,	$15 00
Excavation,	34 50
Footings,	20 00
Foundations,	219 15
Underpinning,	56 40
Hatchway or area,	17 20
Piers and partitions,	3 60
Chimneys, mantels and grates,	321 60
Lathing and plastering,	339 90
Cellar bottom,	55 44
Drains,	15 00
Cistern, catch-basin and cesspool,	20 00
Miscellaneous,	10 00
Total of masonry,	$1,127 79
CARPENTRY.	
Frame,	463 87
Frame covering,	468 67
Roof,	240 14
Cornice,	54 48
Cellar hatchway,	14 34
Windows,	412 08
Dormer windows,	$15 00
Veranda,	163 10
Floors,	369 32
Closets and store-room,	41 76
Doors,	451 86
Stairs,	156 00
Wainscoting and base,	71 31
Pantry and butler's pantry,	20 36
Kitchen sink, etc.,	13 64
Bath-room,	52 20
Mantels,	180 00
Book-cases,	48 00
Washstand and slop-sink,	13 10
Dressers,	19 20
Cold-air duct,	16 82
Coal-bins and partitions in cellar,	21 48
Miscellaneous,	25 20
Painting,	342 00
Heating, tinning, slating and galvanized ironwork,	276 00
Plumbing and gas-fitting,	186 50
Total for house,	$5,264 22

HOUSE FOR P. S. KINSEY, ESQ., NEWARK, N. J. MR. CHARLES EDWARDS, ARCHITECT, PATERSON, N. J.

HOUSE AT WAVE-COAST PARK, FAR ROCKAWAY, L. I., FOR E. H. HARRIMAN, ESQ. MR. W. GIBSON, ARCHITECT, ALBANY, N. Y.

UNION PASSENGER RAILWAY STATION, OGDEN, UTAH. MESSRS. VAN BRUNT & HOWE, ARCHITECTS, BOSTON, MASS.

AMERICAN ARCHITECT COMPETITION FOR HOUSE COSTING $5,000.[1] — X.

THE eight following designs have all worse plans than any of the others, and although the exterior may be somewhat better than some of the preceding, these have been placed near the end of the list on account of extremely poor planning.

"*Dan.*" — Dining-room inconvenient. No direct way of getting to front door from kitchen. Too many chimneys. Waste room in passages. Exterior: too high-shouldered; details of architect's vernacular of ten years ago and carpenter's vernacular of to-day — hard and stiff, without good outline or proportion. Rendering somewhat stiff, but clear, direct and good.

"*Black and White.*" — Nursery should not be on first story nor near living rooms. Details thin and poor. Truncated gables are always bad. Otherwise, house is simple, but common-place.

"*Romantic.*" — Servants obliged to pass through sitting-room to get to front door. Library badly placed. No provisions for nursery or novelist. No details except on perspective, where there are too many, all of which are designed with no idea of scale, purpose or outline. Rendering poor. Stones look woolly, shadows are scratchy and foliage very bad. Design has no sense of simplicity of treatment or of anything except a desire to string together a lot of would-be picturesque units.

"*Don Quixote.*" — To make library and study open through dining-room and parlor is not good planning, nor is a long, narrow corridor in second story. No constructive details; other details heavy, except staircase, which is better, but thin. Exterior badly roofed. No dominating roof. Dormer very bad in form. Rendering hard and stiff.

"*Nota Bene.*" — A nursery next to dining-room and entered through it is a peculiar but not praiseworthy feature. Details bad; no proportions or sense of line. Exterior spotty; needs concentration of motives. Rendering unskilful.

"*A. T.*" — Basement kitchen calls for extra servant. To have children's room next to dining-room is not desirable. Dining-room is reached only through sitting-room, and servant has to come up stairs and pass through two rooms to reach front door. Details stiff. General masses and scheme of exterior very good, but badly carried out. Lacks proportion of eaves and mouldings. House could have more than one chimney with advantage.

"*Long Mow.*" — Staircase arrangement is very poor. No head-room for cellar-stairs, if rooms in first story are on a level, as they seem to be, and, in fact, the staircases are in a perfect snarl and are very dark. Much waste room in centre of house. Exterior simple and uninteresting. Rendering scratchy and unskilful.

"*Eureka.*" — No provision for novelist. Staircase ineffective. Upper hall dark. Details very poor. Exterior is a collection of unrelated parts. No sense of mass, proportion, light and shade, surface or detail. Rendering very poor and weak — evidently the work of a very new hand.

"*Tobacco.*" — No bedroom should open from a dining-room. Details drawn to unnecessarily large scale and are bad throughout. Design is roofed well, but otherwise is the work of one who needs a great deal of study, and is of that perfectly innocently-ignorant class of work that defies criticism. To this class also belongs "*Home A,*" and the design with the long Latin motto, "*Hall Faciemtur,*" etc.

SAFE BUILDING.[1]—IX.

GRAPHICAL METHOD OF CALCULATING STRAINS. — NOTATION.

Notation. THE calculation of strains in trusses and arches is based on the law known as the "Parallelogram of Forces." Before going into same it will be necessary to explain the notation used. If Fig. 16 represents a truss, and the arrows the loads, and the two reactions (or supporting forces), we should call the left reaction O A and the right reaction F O. The loads would be, taking them in their order, A B, B C, C D, D E and E F. The foot, or lower half, of left rafter would be called B K, the upper half C I, while the respective parts of right rafter would be G E and H D. The King post (tie) is I H, and the struts K I and H G, while the lower ties are K O and O G.

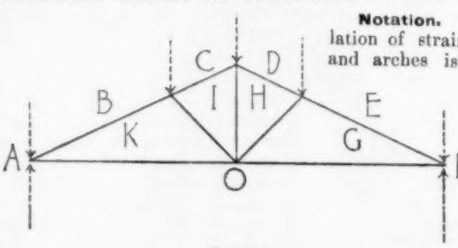


Fig. 16.

In the strain diagram, Fig. 17 (which will be explained presently), the notation is as usual; that is, loads A B, B C, C D, etc., are represented in the strain diagram by the lines *ab*, *bc*, *cd*, etc. Rafter pieces B K, C I, D H and E G are in the strain diagram *b k*, *c i*, *d h* and *e g* (*g* and *k* falling on the same point). I H in Fig 16 becomes *i h* in strain diagram. K I becomes *k i*, H G becomes *h g*, O K becomes *o k*, G O becomes *g o*, O A becomes *o a* and F O becomes *f o*.

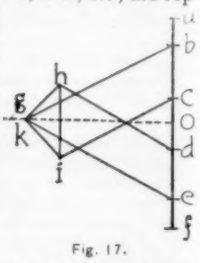


Fig. 17.

Or, in the drawing of the truss itself the lines are called, not by letters placed at the ends of the lines, but by letters placed *each side* of the lines, the lines being between; it is also usual to put these letters in capitals to distinguish them from the letters representing the strain diagram, which are, as usual, at *each end* of the line they represent.

[1] Continued from No. 562, page 158.

[1] Continued from page 159, No. 562.

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"American Architect" Competition ....
for a House to cost $5000
on a County Hillside
by Lewis Tenney

Rear Elevation.

First Floor Plan.

Second Floor Plan.

Hall Mantel

Eaves

Window Frames

Section at AA

Window Head in Front Gable

Newel

Veranda Railing

Porch Cornice

Overhanging Cornice

Base

Scales

Veranda

Reception Room

Living Room

Hall

Library

Dining Room

Kitchen

Pantry

Porch

Family Chamber

Chamber

Children's Room

Bed Room

Screen

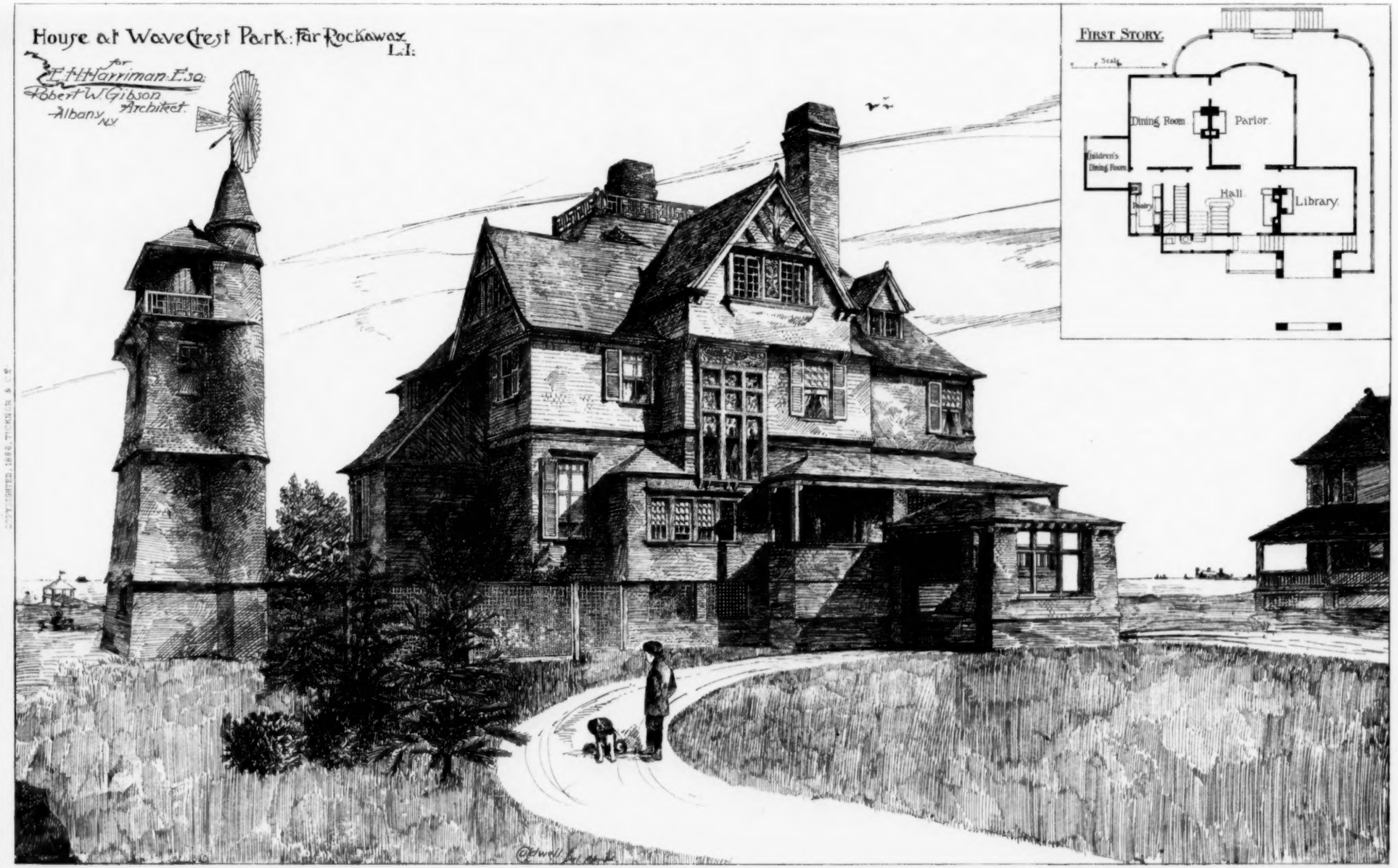
Sink

"American Architect" Competition ....

No. 567 AMERICAN ARCHITECT AND BUILDING NEWS, NOV 6 1886

House at WaveCrest Park: Far Rockaway L.I.

for
E. H. Harriman Esq.
Robert W. Gibson Architect.
Albany N.Y.



HELIOTYPE PRINTING CO. BOSTON

American Architect and Building News, Nov. 6 1886. No. 567

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House for
P. S. Kinsey Esq.
Newark N. J.

C. Edwards, Architect.
Paterson N. J.

HELIOTYPE PRINTING CO. BOSTON.

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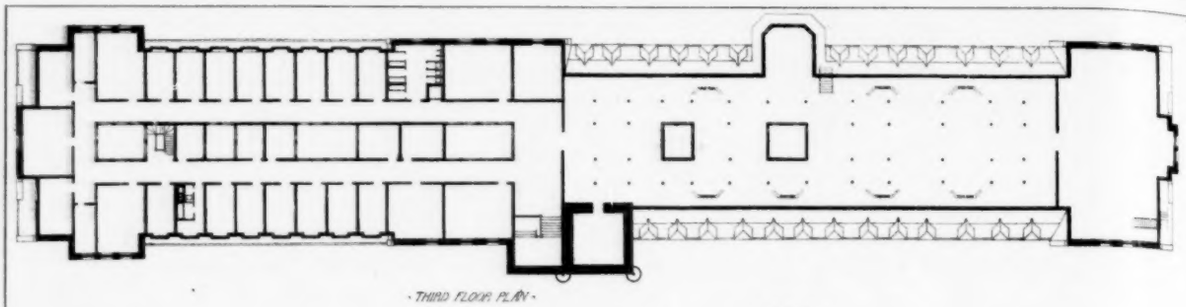
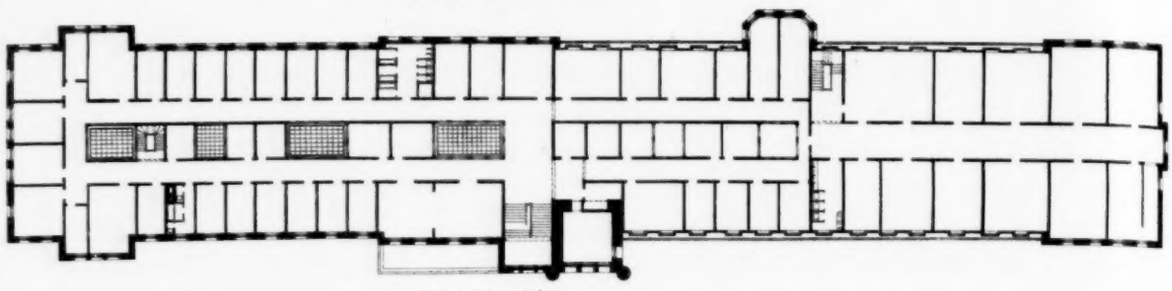
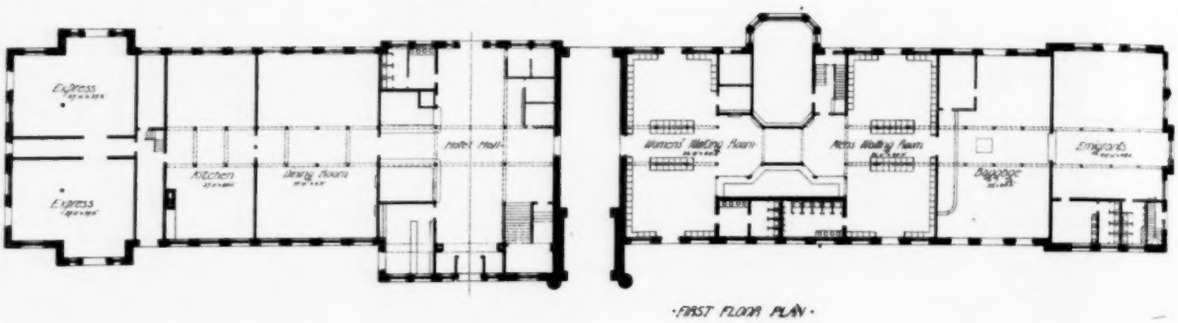
The Heliotype Printing Co. Boston



THIRD FLOOR PLAN



SECOND FLOOR PLAN



FIRST FLOOR PLAN

UNION PASSENGER STATION AT OGDEN, UTAH.

«VAN BRUNT & HOWE ARCHITECTS, BOSTON & KANSAS CITY»

The Heliotype Printing Co Boston

One thing is *very important*, however, and that is, always to read the pieces off in the *correct direction* and in their *proper order*. For instance, if we were examining the joint at middle of left rafter we must read off the pieces in their proper order, as B C, C I, I K, K B, and not jump, as B C, I K, C I, etc., as this would lead to error. Still more important is it to read around the joint in one direction, as from left to right (Fig. 18), that is, in the direction of the arrow. If we were to reverse the reading of the pieces, we should find the direction of the strain or stress reversed in the strain diagram. For instance, if we read K I and then find its corresponding line *k i* in the strain diagram, we find its direction downward, that is, pulling away from the joint, which would make K I a tie-rod, which, of course, is wrong, as we know it is a strut. If, however, we had read correctly *i k* it would be pushing upwards, which, of course, is correct and is the action of a strut.

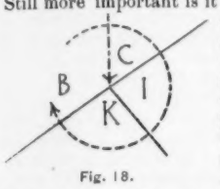


Fig. 18.

When we come to examine the joint at O, however, we reverse the above and here have to read *k i*, which is in the same relative direction for the point O, as was *i k* for the point at centre of left rafter.

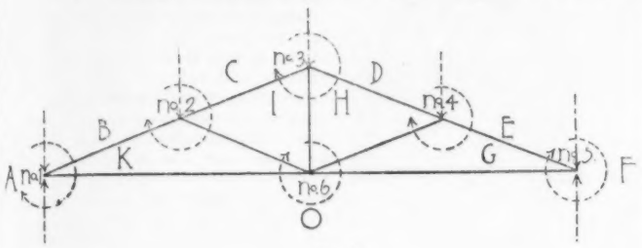


Fig. 19.

The arrows in the accompanying figure (19) show how each joint must be read, and *remember* always to read the pieces in their proper succession.

It makes no difference with which joint or with which piece of the joint we begin, so long as we read in correct succession and direction, thus: for joint No 1 we can read

A B, B K, K O and O A
or K O, O A, A B and B K,
or B K, K O, O A and A B, etc.

In the strain sheet of course we read in the same succession, and it will be found that the lines, as read, point *always* in the correct direction of the strain or stress.

PARALLELOGRAM OF FORCES.

Parallelogram of Forces. If a ball lying at the point A, Fig. 20, is propelled by a power sufficient to drive it in the direction of B, and as far as B in one minute, and at B is again propelled by a power sufficient to drive it in the direction of and as far as the point C in another minute, it will, of course, arrive at C at the end of two minutes, and by the route A B C.

If, on the other hand, both powers had been applied to the ball simultaneously, while lying at A, Fig. 21, it stands to reason that the ball would have reached C, but in one minute and by the route A C. A C (or E D), is, therefore, called the resultant of the forces A E and D A. If, now, we were to apply to the ball, while at A, simultaneously with the forces D A and A E, a third force (E D) sufficient to force the ball in the opposite direction to A C (that is, in the direction of C A), a distance equal to C A in one minute it stands to reason that the ball would remain perfectly motionless at A, as C A being the resultant (that is, the result) of the other two forces, if we oppose them with a power just equal to their own result, it stands to reason that they are completely neutralized. Now, applying this to a more practical case, if we had two sticks lying on A E and D A, Fig. 22, and holding the ball in place, and we apply to the ball a force E D = C A and in the direction C A, we can easily find how *much* each stick must resist or push against the ball. Draw a line *e d*, Fig. 23, parallel to E D, and of a length at any convenient scale equal in amount to force E D; through *e*, Fig. 23, draw *a e* parallel to A E, and through *d* draw *d a* parallel to D A, then the triangle *eda* (not *ead*) is the strain diagram for the Fig. 22, and *d a*, measured by the same scale as *e d*, is the amount of force required for the stick D A to exert, while *a e*, measured by the same scale, is the amount of force required for the stick A E to exert. If in place of the force E D we had had a load, the same truths would hold good, but we should represent the load by a force acting downward in a vertical and plumb line.

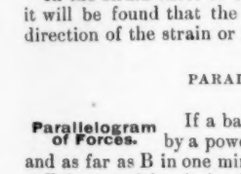


Fig. 20.

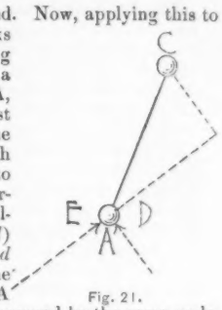
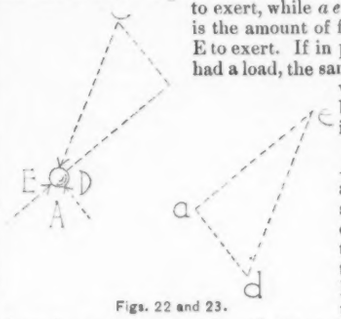


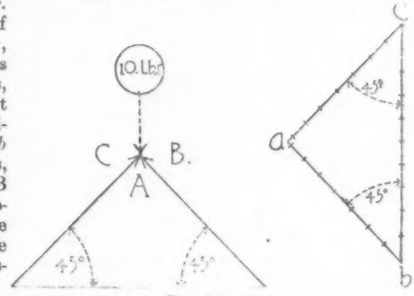
Fig. 21.



Figs. 22 and 23.

Thus, if two sticks, B A and A C, Fig. 24, are supporting a load of ten pounds at their summit, and the inclination of each stick from a horizontal line is 45°, we proceed in the same manner. Draw *c b*, Fig. 25, at any scale equal to ten units, through *b* and *c* draw *b a* and *a c* at angles of 45° each, with *c b*, then measure the number of (scale measure) units in *b a* and *a c*, which, of course, we find to be a little over seven. Therefore, each stick must resist with a force equal to a little over seven pounds.

Now, to find the direction of the forces. In Fig. 24 we read C B, B A and A C, the corresponding parts in the strain diagram, Fig. 25, are *c b*, *b a* and *a c*. Now the direction of *c b* is downwards, therefore C B acts downwards, which is, of course, the effect of a weight. The direction, however, of *b a* and *a c* is upwards, therefore B A and A B must be pushing upwards, or *towards* the weight, and therefore they are in compression.



Figs. 24 and 25.

The same truths hold good no matter how many forces we have acting at any point; that is, if the point remains in equilibrium (all the forces neutralizing each other), we can construct a strain diagram which will always be a *closed* polygon with as many sides as there are forces, and each side equal and parallel to one of the forces, and the sides being in the same succession to each other as the forces are. We can now proceed to dissect a simple truss.

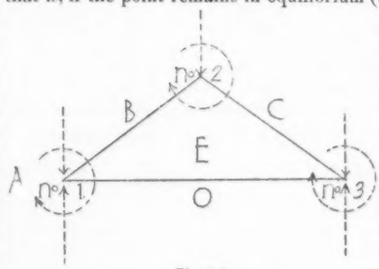


Fig. 26.

Roof Trusses. Take a roof truss with two rafters and a single tie-beam. The rafters are supposed to be loaded uniformly, and to be strong enough not to give way transversely, but to transfer safely one half of the load on each rafter to be supported on each joint at the ends of the rafter. We consider each joint separately. Take joint No. 1, Fig. 26.

GLOSSARY OF SYMBOLS.—The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.: —

a = *area*, in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
f = *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g_1 = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches. [See Table I.]
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars. [See Table I.]
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches. [See Table I.]
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches. [See Table I.]
$\mathfrak{D}$ = *diameter*, in inches.
$\mathfrak{r}$ = *radius*, in inches.
π = 3.14159, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle*.

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_{I}, a_{II}, a_{III}, etc., or b, b_{I}, b_{II}, b_{III}, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance: —

m = moment or bending moment at *centre*.
m_{A} = " " " *point A*.
m_{B} = " " " *point B*.
m_{X} = " " " *point X*.
s = strain at *centre*.
s_{B} = " *point B*.
s_{X} = " *point X*.
v = stress at *centre*.
v_{D} = " *point D*.
v_{X} = " *point X*.
w = load at *centre*.
w_{A} = " *point A*.

We have four forces, one O A (the left-hand reaction), being equal to half the load on the whole truss; next, A B, equal to half the load on the rafter B E. Then we have the force acting along B E, of which we do not as yet know amount or direction (up or down), but only know that it is parallel to B E; the same is all we know, as yet, of the force E O. Now draw, at any scale, Fig. 27, No. 1, *o a* = and parallel to O A, then from *a* draw *a b* = and parallel to A B (*a b* will, of course, lap over part of *o a*, but this does not affect anything). Then from *b* draw *b e* parallel to B E, and through *o* draw *e o* parallel to E O. Now, in reading off strains, begin at O A, then pass in succession to A B, B E and E O. Follow on the strain diagram Fig. 27, No. 1, the direction as read off with the finger (that is, *o a*, *a b*, *b e* and *e o*), and we have the actual directions of the strains. Thus *o a* is up, therefore pushing up; *a b* is down, therefore pushing down; *b e* is downwards, therefore pushing against joint No. 1 (and we know it is compression); lastly, *e o* is pushing to the right, therefore pulling away from the joint No. 1, and we know it is a tie-rod. In a similar manner we examine the joints 2 and 3, getting the strain diagrams No. 2 and No. 3 of Fig. 27. In Fig. 28, we get the same results exactly as in the above three diagrams of Fig. 27, only for simplicity they are combined into one diagram.

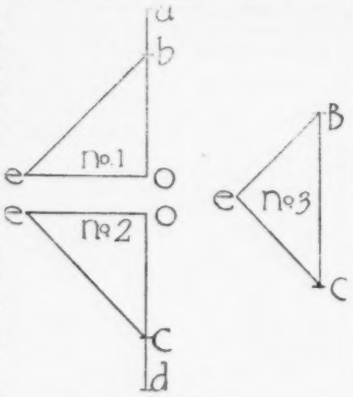


Fig. 27.

If the single (combination) diagram, Fig. 28, should prove confusing to the student, let him make a separate diagram for each joint, if he will, as in Fig. 27. The above gives the principle of calculating the strength of trusses, graphically, and will be more fully used later on in practical examples.

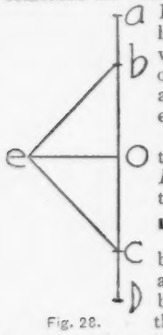


Fig. 28.

Should the student desire a fuller knowledge of the subject, let him refer to "*Greene's Analysis of Roof Trusses*," which is simple, short, and by far the best manual on the subject.

Line of Pressure Central. In roof and other trusses the line of pressure or tension will always be co-incident with the central line or longitudinal axis of each piece. Each joint should, therefore, be so designed that the central lines or axes of all the pieces will go through one point. Thus, for instance, the foot of a king post should be designed as per Fig. 29.

In roof-trusses where the rafters support purlins, the rafters must not only be made strong enough to resist the compressive strain on them, but *in addition to this enough material must be added* to stand the transverse strain. Each part of the rafter is treated as a separate beam, supported at each joint, and the amount of reaction at each joint must be taken as the load at the joint. The same holds good of the tie-beam, when it has a ceiling or other weights suspended from it; of course these weights must all be shown by arrows on the drawing of the truss, so as to get their full allowance in the strain diagram. Strains in opposite directions, of course, counteract each other; the stress, therefore, to be exerted by the material need only be equal to the difference between the amounts of the opposing strains, and, of course, this stress will be directed against the larger strain.

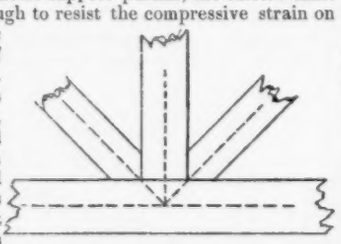


Fig. 29.

A Tall Chimney.—A chimney was built in 1885 for a lead-smelting works at Pueblo, Cal., which is 319 feet in height, 10 feet in diameter in the clear from the foundation up. It rests on 16 feet of smelter slag, which was poured in a liquid state in the ground 16 feet deep, and allowed to cool and solidify. On top of this, and above ground, is a second foundation 16 feet high, made of brick. The stack proper, which is 287 feet high, is made of iron and lined with fire-brick. It is the largest stack west of the Missouri River.

Fire from Heated Asbestos.—Fire originating from heated asbestos intended as sheathing is noted by a patrol inspector in Philadelphia. In one or two recent instances the combustion chamber of a regenerative gas lamp was too near certain woodwork, and asbestos was inserted between, but the heat soon penetrated the stratum of asbestos and set fire to the wood. In the other case the sheet-iron top of a portable heater was within a few inches of the joists of first floor; asbestos was placed on the heater, but heat passed through and the joists took fire. Heat was always above 300° Fahrenheit, and confined. No fires were noted from steam-pipes sheathed in asbestos. The inspector recommends as a safeguard from the heating of the non-inflammable fibrous stone an unobstructed air-current between the source of the heat and the asbestos covering.—*Iron Age.*

TAKING OUT QUANTITIES.

Although the following rules apply to English practice, they seem so comprehensive in themselves as to make it worth while to reproduce them in *extenso*.

The Manchester Society of Architects has just issued a revised edition of their General Statement, originally published nearly fourteen years since, of the methods recommended to be used in taking quantities and measuring up works. It is thirteen years since the last revision was undertaken, and although in some matters the directions cannot apply all over the country, we think the Statement is worth reproducing, and that the Manchester Society of Architects has done well to reissue it.

In taking quantities it will always be desirable to bear the character of the works in mind, and so to measure and describe them as to give parties estimating the clearest idea, and at the same time in the most concise manner, of their cost and character. In measuring up works already executed it is, of course, only necessary to ascertain on what principle of measurement the prices have been determined, and then proceed accordingly.

GENERALLY.

Fees to corporation, hoarding, propping sides of foundations or walls, and use of water for the different trades, to be mentioned in the trade that has to provide them, or under the head of charges to be borne by the general contractor. (If the right of advertising on hoarding is to be reserved by the proprietor, it should be so stated.) Each trade to provide its own scaffolding, unless specially mentioned. Each trade to provide its own mortar. Protecting masonry with slabs, etc., to be put by preference in carpenter's work. Expense of watchman, making good damaged work, etc., to be inserted as occasion may arise. Each trade to provide for the expense of the attendance on the other tradesmen, and for cutting holes, and making good, etc. When the general contractor is expected to be responsible for damage by fire, an item for insurance to be put in the quantities, by preference in the carpenter's work. Any provision of sums of money or values for articles shall denote the net cash to be paid by the builder, exclusive of his profit and the cost of materials and labor required for fixing, which, however, should be fully stated. Clerk-of-work's office and custody of drawings to be provided for.

EXCAVATOR.

1. Stripping surface-soil — deep, and wheeling in heaps — yards run, to be measured in superficial yards. 2. Excavating to be given in cubic yards, measured to three inches beyond the outer edge of footings; with extra beyond for batter of sides of excavation, depending on depth and nature of soil. State whether material is to be left on the ground or carted away; and if wheeled, state the distance. Extra price for wheeling every twenty yards run additional. The excavating for each successive depth to be kept separate, and the nature of the material to be excavated to be mentioned if possible. 3. Excavating to trenches for walls, etc., to be measured in cubic yards, and to be kept separate from the above, as also for underpinning or any special work that has to be executed separately. 4. Filling in and ramming to foundations, to be given as an item, or, if thought desirable, to be done by day-work. 5. Clearing away rubbish from time to time, to be given as an item. 6. Filling in, or forming foundation for paving and flagging, to be taken in superficial yards, and state depth and material; or add this to the item of paving or flagging in mason's work. 7. Drains to be given in lineal yards with description thereof, to include cutting trenches and laying; describe method of jointing and filling in; and state average depth of each kind, and, when practicable, mention whether in rock or other kind of ground. 8. Junctions, bends, etc., to be counted extra beyond the length of drains. 9. Cutting trenches and filling in to gas and water pipes (see Plumber), to be given in lineal yards. 10. Wells, cesspools, eyes, etc., to be given with proper particulars, as the work may require. 11. Keeping foundations clear of water beyond ordinary rainfall, or for propping to streets or adjoining buildings, to be given as items.

BRICKSETTER.

1. Give description of materials and mortar and quality of work. The work, unless otherwise mentioned, to be reduced to one brick thick, and called "brick-length walling," in yards superficial. If sand, gravel, or water, on the spot is not intended to be used, state

so. If there be much work of half a brick only it is desirable to mention it. Where a building is lofty it is desirable to divide the work into stages vertically. 2. To obviate any misunderstanding as to so-called trade usages, with regard to other materials, as stone, etc., built in, it is proposed to measure the net quantity of brickwork to be executed; deducting entirely all labor and materials in openings having more than 100 square feet "*face*" measure and deducting materials only (leaving "hollows" for labor) on the following:

(*a*). All other openings than the above, the shape they are actually executed, provided they are openings in the walls and built above with the same materials.

(*b*). All sills, strings, cornices, etc., and other masonry or dressings built in, and being six or more inches high. The "hollows" thereon being assumed to pay for the labor in providing proper bed therefor, filling up thereto, and pointing up.

(*c*). Fireplace openings from underside hearth, and all flues, to be deducted as "hollows," and the lineal dimensions of flues (with size, if various), to be given for extra labor forming, pointing and coring out.

3. Joists and beam-ends, wall-plates, door-frames, band and gudgeon-stones, codge-stones, beam-stones of ordinary dimensions, not to be deducted if built in with the work. 4. All walls finished with a bevelled upper edge, as to gables, eaves, etc., to be measured to three inches above the average height; and the lineal dimensions of "beam filling" between spar feet and of "gable cutting" given. 5. Any work intended to be whitewashed, to be measured "superficial," over all openings for pointing. 6. All splay cutting (with width), bevelled arrises, moulded arrises, bands of fancy work (with description), cutting to any shape not square, for ramps, hood-moulds, etc., etc., double or other shaped reveals, to be given lineal. 7. Stops to chamfers, and other single points requiring special labor to be counted. 8. All brickwork in projecting bands, cornices, etc., to be measured as walling, the labor as above in number 6. 9. Facing to be measured superficial for "extra price over common;" and the net quantity executed only to be given, after deducting all strings, sills, etc., etc. All openings less than 100 feet to be deducted and kept separate as "hollows for extra labor over common work," to pay for the labor, plumbing, and setting out. Reveals to be measured for facing separately. 10. Cavity walling to be measured the actual thickness of the bricks, as, for instance, to be measured at one and one-half bricks or two bricks, etc., as the case may be; and the superficial dimension of the wall measured across all openings under 100 square feet, as "extra labor and extra materials for bond, forming cavity walls." The nature of the ties to be mentioned. 11. Work in cement or other material than the general run, to be taken for "extra price over mortar," and the description of the material given. 12. Backing up to ashlar walling to be kept separate from the ordinary walling. 13. Wrought-iron bond, if used, to be given in lineal feet. 14. Common relieving arches to be counted with average span, and separated into various thicknesses of wall, and number of rims in depth, and this to cover all extra labor and materials. 15. Arches in facing to be either counted, with spans, depth, and soffit given, and this to include all extra labor and materials, including skewbacks, and cutting super-imposed work to fit the rake; or else measured superficial as executed, for "extra labor and materials over facing;" girthing the face and soffit net, and measuring separately the skewbacks, and cutting super-imposed work to fit the rake, when the shape of the arches requires it. 16. Ordinary arching to fireproof floors, etc., to be measured stuff and work in square yards, with description and thickness, girthing along the line of average thickness, and measure the lineal feet of skewbacks with description. Groins to be measured lineal. Allow for cutting and fitting to ironwork. 17. Trimmer arches to be counted, with average size, for "stuff and work," including backing-up, and state whether solid or concrete backing is intended. 18. Backing to arches that have been measured, as in number 16, to be taken superficial, with average thickness and description of material. 19. Damp-proof courses to be given lineal with widths. 20. Risers for slopstones, steps, flagshelves, etc., to be counted for "stuff and work," or, if measured as walling, to be kept separate, and so stated. 21. Wine-bin divisions measured superficial, with thickness, and kept separate, or with the above. 22. Eyes, air-grids, chimney-pots, setting-grates, or other special items, to be counted, with description, and the mode of executing the work. 23. Covering walls to protect them on special occasions, and manner of doing it, to be added to the bricksetter's contract. 24. Items: to cleaning down, making good, pointing, etc., at finish. 25. It would be well to call the contractor's attention to the fact that his price must include making good any damage done by frost. 26. Concrete in foundations to be measured by the cube yard.

MASON.

1. Plain ashlar walling and parpoint walling to be measured superficial, net work, for "stuff and work," giving the kind of face, and average sizes and bed of stones; allowance to be made where square blocks have to be cut to suit shaped openings, ramps, etc., and defining the number and dimensions of the through stones. Reveals to be measured extra. Rubble walling up to eighteen inches in thickness to be measured superficial and described; above that thickness to be measured in the cube and described. 2. Other masonry to be measured as hereafter mentioned, keeping the stone and labor separate, or when conducing to the better understanding of the work, as in strings, etc., to be measured in lineal feet, "materials and labor," with sufficient particulars to enable the number of joints to be included; count the fair ends, quoins, etc. 3. Work in chimneys, or cornices, etc., requiring special appliances for hoisting, or at considerable heights, or of extra dimensions, to be kept separate, so far as the material, hoisting, and setting are concerned; the labor, when done on the ground, may be thrown in with the rest. 4. Under the head "stone" must be included the labor in hoisting and setting, and state approximately the quantity to be set above forty feet from the ground. 5. Special appliances for hoisting, such as travelling-cranes, etc., to be specially mentioned. 6. In measuring the cubic feet of stone for other than the work previously mentioned, one inch each way beyond the net dimensions of each block, when worked, to be added. 7. In measuring the labor, the necessary operations of the workman to be followed. The beds and joints of each block to be measured, and kept under that head; and it will conduce to more easy pricing of the work when these can be given in lineal feet, with the average width, particularly for strings, cornices, architraves, jambs, etc. 8. The work exposed to sight to be classified under its different heads, mentioning whether basted, tooled, or polished, and giving plain work, sunk, moulded, sunk and moulded (this when the straightedge will not work the block from a mould applied at each end), weathered, sunk and weathered, and the various kinds of fancy surfaces, and clearly distinguishing from straight work that which is raking, circular, circular on circular, etc. 9. Raised or sunk panels will require that face of the block to be first measured for plain work (for setting out on), then the face work, and the lineal feet of margin of its particular kind. 10. The points from which to girth moulded work will be best ascertained by a consideration of the manual process followed in its execution; in some strings it will thus have to be girthed from wall above to wall below; in other instances, as cornices, where the top is measured for sunk and weathered work, the moulded work will girth from the nose only. 11. All mitres to be counted, with the girth of the mould, etc., they belong to, and state whether internal or external. 12. Throats to be clearly given, either separately in lineal feet, where the soffit has been measured as a "bed," or, in other instances, girthed in with the moulded work. 13. The back of masonry will not generally require any notice, except where it shows through a wall that is not plastered, and in some quoins that bed more than the thickness of the walls, where the sinking must be taken into account. Tooling or rubbing backs of architraves, mullions, etc., to bed frames against, to be measured lineal, and all checking out for the same purposes to be measured in the same way. 14. Holes for flues, timbers, etc., to be counted. 15. Rough sinking down as a preparation for the carver to be given superficially, girthing round the cap, truss, etc., etc. 16. All carving to be clearly set forth with reference to the drawings or special marginal sketches; running ornaments to be given lineal with the girth; but caps, bosses, trusses, modillions, pateræ, etc., numbered. State if carver is to find his own scaffolding. 17. Ordinary window sills to be numbered, with dimensions. 18. Others than these to be taken cube, and the labor taken out as before, and in addition the seats counted for jambs, mullions, etc. 19. As tracery will generally be of a description between the work of an ordinary mason and that of a carver, the most satisfactory way would appear to be to measure one face over all the work as plain work for setting out on, and then number each piece of tracery with its dimensions and reference to the drawings or special marginal sketch for the remainder of the labor, but measuring separately any groove or rebate for glazing. 20. Mullions and other work with little material, as compared with the labor, to be measured lineal, "stuff and work," with particulars or sketch, and give general indication of the lengths. 21. Columns to be girthed for circular work (with or without entasis, as the case may be), and flutes measured lineal with sketch, and number of stops counted; if in extra lengths, keep both materials and labor under a separate head. 22. Rustics and other channelled work to be measured lineal (after the surface and beds have been fully measured), with sketch. 23. Cramps and dowels to be counted, with average size or weight, if metal, and letting in and running; and state whether mason is to find lead. 24. Copings, where worked out of flags or thin material, to be measured lineal, and net as fixed, with proper description of each face and mode of jointing. All knees, apex, and foot-stones to be counted with sketch or particulars of labor thereon. Any perforations for flues, etc., to be counted. 25. Flagging to be measured net, in square yards, with proper description of materials, average and minimum size of flags, method of jointing and laying; and whether mason to provide bed and mortar, and if so, describe same. All exposed nosings to be measured lineal; and any perforations or notchings cut to fit special corners or other objects, to be counted or measured, and the portion so notched out of any flag included in the gross measurement. 26. Flags, if required to be above twelve feet superficial, to be kept under the head of "landings." 27. Any special mode of jointing flags or landings, as lap or joggle joint, to be measured once along the joint. 28. Hearths to be given in superficial feet, and if the fore and back hearth be in one piece, state "large sizes," and count the notchings for jambs. 29. Paving to be measured net, with description of sets and method of laying, and whether mason finds the bed or not. 30. Keep each kind of tiling to floors separate, and state whether and what kind of bed is to be provided. 31. Bond and gudgeon stones, codge stones, beam and pillar stones to be counted, with dimensions and particulars of work thereon, and whether mason has to let it and

run any iron work therein, or to find lead therefor. 32. Steps, where practicable, are best counted, with dimensions and particulars; solid steps may be taken lineal, with average length, and count the number for pinning in, and also the worked ends. All letting in of balusters, newels, etc., to be clearly given, and joggle or notched joints measured. 33. Landings, half spaces, etc., to be either counted with description or taken superficial, with all joints, worked edges, and soffits measured. 34. Letting in of grids to drains, coal-places, areas, etc., to be counted, and state whether lead to be found, and if the stone or curb has to be rebated state so. 35. Area and other curbs to be taken lineal, and if cramped, so stated, with average lengths of stone. 36. Dubbing out with flags, for cornices, etc., for the plasterer, to be taken lineal, with width and thickness, and any special labor. 37. Slopstones, etc., to be either counted with particulars, or measured superficial, with the labor, the sinking to be girthed bottom and sides each way; mention the hole for grid, and whether to be fixed by the mason. 38. Mason's work generally requires very minute subdivision in measuring, and a knowledge of the method of working stone is essential to the proper performance of that duty. Each necessary operation of the workman should be taken into account, although it may appear that the same surface (as in panelled or enriched work, etc.), has to be measured more than once for different descriptions of work. 39. Clean down and leave all perfect at completion as an item.

CARPENTER AND JOINER.

1. Unless a special provision be made that timber and joiner's work must finish net to the dimensions given (the waste being calculated then in the price), it must be understood that all work will follow the original marking or "pricking" for sawing; thus each sawn face would reduce the scantling by nearly one-sixteenth of an inch, or half the width of sawcut, and each wrought face would entail a further reduction of about one-sixteenth of an inch. A twelve by six inch scantling would thus measure eleven and seven-eighths inches by five and seven-eighths inches full, and a two-inch door would finish one and three-fourths inches full. 2. Labor, framing and nails to be measured superficial, in square yards, for floors, roofs, and ceiling joists; keeping the different descriptions, whether for single-joisted or framed, separate, and defining the mode of framing, and taking the dimensions over the extremities of the timbers, or the timber may be taken cube and to include the labor. 3. Labor framing principals to be measured the length of span, with wallhold, and separating the different kinds; the same with framing trussed partitions. 4. Ordinary studded partitions, and filling-in to the above, to be taken superficial, in yards, for "stuff and work," with scantlings and distances apart. 5. Labor framing hips and valleys in lineal feet. 6. Gutters lineal, or, if wide, superficial, and state if with bearers; count cesspools, with dimensions. 7. The timber to be taken cube when sawed to scantling, keeping as far as practicable, large scantlings, as beams, purlins, large joists, etc., separate from small, as spars, plates, etc. Beams are best given in lineal dimensions, and when over thirty-five feet long should be kept separate. 8. When conducing to the better understanding of the work, however, large timbers, or those with special labor, to be measured lineal and properly described. 9. Deals, planks, and battens, used for joists, etc., to be taken superficial or cube. 10. Planing or other special labor to timbers measured superficial or lineal in feet, and stops to beads or chamfers counted. 11. All timbers to be measured net lengths as fixed, and trimmings for hearths, wells, skylights, etc., counted. 12. Angle beads, staff beads, and tilting fillets in lineal feet. 13. Bolts, dogs, straps, etc., of iron to be counted, keeping joint-bolts separate from others. 14. Nogs and templates to be counted or kept separate under a cube or lineal dimension. 15. Snowboards, in lineal feet, with width and description. 16. Ridge and other rolls, and hip and valley boarding, in lineal feet, with width. 17. Centreing, in square yards, except centres for doors and window-openings, etc., which are to be counted, with span and width. In extensive fireproof works, a small quantity of centreing will often suffice if "taking down and refixing" be given, together with the necessary staying. 18. Cornices and face-boards in lineal feet, with description and particulars of bearers, etc., and count mitres to the former. 19. Ordinary flooring in square yards net; mitred margins to be counted. 20. Pugging to floors, measure across the timbers and state description, whether on slabs and fillets, or laths, and if filled in, describe. 21. Skirtings in lineal feet as fixed, with dimensions and description, and state whether to include grounds; where above seven inches, count all mitres and ramps, and labor of housing to architraves, chimneypieces, etc.; if tongued to floor-board, state so. 22. Door-casings and frames in lineal feet (allowing length for tenons, etc.), and state whether framed, and number of rebates; count frames for dowelling. 23. Doors, grates, etc., net size, in superficial feet, allowing for rebate in folding-doors, keeping each description separate, and state if flush-beaded at meeting edges, or for double margins, etc.; hanging to be counted and described, locks and other fittings at a price each and labor fixing; bolts to dimensions, and ditto. 24. Architraves in lineal feet, net measure, and state if with grounds, and, except for single moulds up to three inches, count all mitres, or special adaptations; blocks to be counted in pairs, including all labor-fitting architraves thereto. 25. Window sashes and frames to be measured full size of frames; if not square headed, state so, or else count the heads for extra price, with description; state if extra strength be required in any part of frame, or any particular way of working weatherings, sinkings, etc. 26. Casement sheets and frames to be measured separately and as above, with scantlings. 27. State if holdfasts or other particular mode of fixing frames be required. 28. Skylights to be measured full size. Any portion of a sheet made to open, to be measured again in addition, if it is a separate piece of framing, and any grooving, whether fillets, etc., accounted for. 29. Window backs and elbows, and soffits, and linings, worked one side only, to be kept separate from shutters, and state if to have grounds; if linings are under nine inches wide, take lineal, with the width. Plinths and capping and flush beads to be measured lineal. Hanging sheets and casements to be counted, with particulars of pulleys, cords, weights, hinges, fastenings, etc. Hanging shutters and backlaps ditto. Window bottoms lineal, and count returned ends. 30. Bracketing for cornices in lineal feet, with girth or sketch of brackets, and distances apart. 31. Coves, superficial feet for stuff and work. 32. Cradling round beams, superficial for stuff and work. 33. Bridging for floors in lineal feet, and state whether slab or herring-bone bridging, also whether tie-rod or hoop is to be used. 34. Wall-boarding and dadoes in superficial feet, and give lineal feet of grounds, and also fitting to architraves, etc. 35. All casings to underside beams, gutters, cistern, etc., in superficial feet, with description, or else lineal, with girth and number of beads. 36. Pipe-casing, ditto, and state if to be fitted with screws, for taking down at pleasure. 37. The different items of water-closets to be kept separate, and state if fitted with screws, etc., to take down; seat and bearers, fall and frame, riser, all superficial; skirting, superficial or lineal, according to requirements; capping separate. Holes cutting, falls hanging, hinges, paper boxes, etc., and attendance on plumber to be counted. 38. For bath framing take riser and skirting as for water-closets; bearer for curb lineal; curb lineal, with average width or superficial. 39. French polishing to be, where practicable, measured separately in superficial feet. 40. Fixtures require careful measurement in detail; skeleton-fronts for drawers and small cupboard fronts separate from the fronts themselves; bearers, false-bottoms, drawers fitting with stops, hanging-doors, knobs, and other fastenings, divisions, guides, etc., all to be taken into account; shelves with widths and bearers or brackets, also hook-rails, all lineal. 41. Stairs, in ordinary cases, to be counted, with dimensions, and state whether returned nosings and cut-string boards, notch boards, and number of carriages; measure hand-rail and balusters, and newels separate; and casing and nosing, hand-rails and balusters along landings; count ramps, scrolls, curtain-ends, and circular corners to wells; give spandrel framing separate from square framed work; state French-polishing; landings to be taken superficial in feet, including bearers and nosings, etc., at the edge, to be taken lineal. 42. All other items of ironmongery to be counted, with particulars, or price and labor fixing in addition. 43. All circular work throughout to be kept separate from straight work. 44. Enter up reserved amounts, provisions of materials, or cash, etc., and clearly state if such are to include contractor's profit or to be deducted in full. 45. The carpenter generally undertakes the fixing of the ironwork, and in many instances it might be desirable to put the fixing and staying during erection in his quantities, giving the weight of cast and wrought iron beams, etc., and counting the bolts, rods, etc. 46. Insurance, if to be provided for by the carpenter, to be entered.

PLASTERER AND PAINTER.

1. State description of materials, and keep the work of each kind separate. 2. Plastering on walls to be measured from the floor upwards, or from the point where each description of work commences. 3. Where cornices are lathed on brackets, measure ceiling and walls to the edge of the brackets only. 4. Where cornices are not bracketed, measure the ceiling full size of room, and the walls up to ceiling; all in superficial yards. 5. Deduct all openings 100 square feet and over; deduct materials and add labor (hollows) for net sizes of doors, windows, fireplaces, and other openings under 100 feet superficial. 6. Where ceilings are panelled and coffered, or coved, girth round all portions that are lathed, keeping circular work separate. 7. Ceilings plastered between spars, etc., to be measured across the spars and purlins, and even then kept separate, and described as such. 8. All work run with a mould to be measured lineal on the wall and the girth given, as cornices, rustics, strings, architraves, soffits, quirks, etc.; count all mitres, with the girth of mould they belong to; count mitres in panelled work. 9. All cornices, etc., lathed on brackets to be kept separate, and described as such. 10. All cast work to be counted, except running enrichments. 11. Enriched members to be measured lineal, with girth. 12. Modelling of enrichments to be, if special, so stated, and the models to be the property of the architect. 13. Ceilings or walls covered with panels, formed by small moulds, to be measured superficial, with illustration or drawing, for "extra price over plain work;" larger panelling or special decorative features to be measured in detail. 14. Angles to pilasters, etc., if specially formed in cement or otherwise, to be so measured, lineal and extra to plastering. 15. Door and window frames, bedding, and pointing, to be counted, and state material to be used; also flushing to inside of frames after fixing, or behind casings, window-backs, or other work to be given. 16. Marking goods generally, and after plumber, gasfitter, bell-hanger, etc., and chimneypieces, as an item, stating numbers. 17. Coloring and whitewashing walls, etc., to be in superficial

yards, measuring over all openings under 100 superficial feet; if the work has to be pointed by the plasterer, state so. 18. Painting to include stopping and knotting, and to be given in square yards. Priming to be separate, if on work painted before being fixed. Painting to be girthed round all exposed surfaces, except as below. 19. Balusters, if ordinary square, and grids, gates, and other metal-work painted on both sides, with bars about five inches to six inches apart, to be measured one surface only; if closer or slightly ornamental, one and one-half surfaces; and for very close or very ornamental work, two to two and one-half surfaces. 20. Windows to be measured each surface over full size of opening for painting frame and sheets, or else the frames counted, and the sheets, if large squares, counted; but if in small squares (as old-fashioned crown-glazing), then count the squares instead of the sheets. 21. Fancy or ornamental painting to be measured in detail, with lengths of mouldings picked out, gilt, etc. All work in parti-colors to be kept separate from plain work.

PLUMBER AND GLAZIER.

1. The lead to be reduced to weight, and the different kinds of work kept separate, as gutters, flashings, valleys, and ridges, and flats; the work requiring solder, as cisterns and cesspools, dressing over finials, and other fancy work; allow proper lap, as specified, to flashings, drips and rolls; the net quantity of lead, as fixed, only to be measured. 2. All water-supply, service, waste, or other pipes, to be given in lineal feet, with the weight per foot or thickness; the dimensions stated to mean in all cases, whether specified or not, the clear internal bore. The price to include all soldering and forming joints, wall-hooks, and fixing. 3. No allowance to be measured for sockets and joints in iron-piping, down-spouts, etc.; but state whether flanges or holdfasts are to be included. 4. If pipes are to be laid in trenches in the ground, state so, and how, and whether plumber is to do the excavator's work. 5. Count all traps, and also all bends and shoes to down-spouts or soil-pipes, spitters from cesspools to spouts, rain-water heads, taps, plugs, overflows, wastes with plug and washer, water-closet, and bath fittings (the pipes thereto and therefrom measured with the other piping), wash-basins, urinals, hot-water cisterns, and other special fittings, and in all such instances to give a clear, unmistakable description of what is required, or the price, exclusive of fixing. 6. Iron-gutters and down-pipes to be measured in lineal yards; no allowance for joints, but elbows, stopped-ends, etc., to be counted and described. 7. The different descriptions of glass, with thickness or weight per foot, to be given in superficial feet, assorting each into different average sizes, and keeping bent sheets separate. Curved or other special edges to be measured lineal, the glass being first measured the size such special shape has to be cut from. Special descriptions of work, such as lead-lights, etc., to be described. 8. Pointing to flashings to be measured lineal and described. 9. Making good and leaving all perfect at conclusion of works, as an item.

IRONFOUNDER.

1. The most suitable method is to reduce each description of work to weight, keeping columns separate from beams, small castings from large, and intricate ones, as railing, grids, etc., separate from plain ones; the cost to include pattern making; any fancy work to be specially mentioned, and the castings from each such pattern kept separate from others; the metal to be taken at 40 pounds per foot superficial, one-inch thick. 2. State whether price to include fixing. (*Vide* No. 45 in Carpenter). 3. Special labor, as turning columns, coupling boxes, etc., to be given in detail. 4. State whether beams are to be tested, and if at contractor's expense and risk. 5. Bolts and other small fittings to be counted and described, with the labor necessary in preparing for and fixing them. 6. State whether lead or other material is to be found for running lugs, etc., and indicate the number of them. 7. Long-bolts, tie-rods, etc., to be measured lineal, with allowance for head and nut, and count the number of nuts, and screwing, and washers. 8. Swing-sheets, gates, etc., and their fittings, hangings, and fastenings to be fully described and counted, both for materials and labor. 9. In measuring wrought-iron beams and frame-work, ascertain the weight of metal in plates and other shapes, adding the rivets and bolts, with the labor separate on any particular forgings or cuttings. 10. All wrought-iron rolled or built girders to be fully described and given in lineal lengths, with section. 11. If painted before fixing, to be measured in full.

SLATER AND TILER.

1. State size and description of slates or tiles, nails, and battens, and whether and how pointed underneath, and amount of lap. 2. The usage varying with respect to allowances at eaves for double course, and hips and valleys for waste, the Manchester Society of Architects purposes to measure slating net as finished, and to give the length of eaves for extra price of double course, and the length of each bevelled edge at hips and valleys, etc., for "single bevel cutting and waste," and also the bevel cutting where so done to land-gutters, etc. All openings of 100 feet to be deducted entirely, and any others, but allowing for labor as "hollows," below that amount down to six feet superficial, below which no deductions to be made. Any special cutting, as close hips, etc., to be separately mentioned and described. 3. In tile-roofs, hips and valleys to be measured lineal, and fitting included. 4. Ridge-tiling to be fully described and given in lineal yards, and state how to be bedded and pointed. 5. Pointing to overhanging eaves or gables, in lineal feet. 6. Sweeping and cleaning out gutters, leaving all clean and perfect. 7. Circular slating, fancy courses, slating to spires, or other special work, to be kept separate and fully described.

SUNDRIES.

Floor or wall tiling, paper-hanging, cooking and heating apparatus, bell-hanging and gasfitting, are generally matters of separate arrangement with the tradesmen. If requisite to include the two latter, bell-hanging may be given at so many bells with one pull, and so many with two, the furniture being described and counted; gasfitting at so much per position, exclusive of meter, for piping and brass bits, or else measured in detail as for waterpiping.

COUNTERFEIT "ANTIQUE" FURNITURE.

TRUQUAGE, although a term probably unfamiliar to many readers, nevertheless deserves to rank among the finer arts of modern civilization, such is the ingenuity, industry and skill with which it is carried out. Burns' cotter mother was chiefly admirable for the skill with which she "gar'd auld things look maist as weel as new;" but the *truqueur* devotes himself, on the contrary, to the art of making new things look quite as good as old. The stock in trade of the French *truqueur* and his English congener, quite as expert as he, need not be large. Walnut juice, which gives an agreeable mellowness of tone, and nitric acid are neither of them expensive. The latter imitates pretty closely the ravages of ants, and holes bored with a fine auger easily give the worm-eaten appearance which appeals to the lover of the antique in carved furniture. A correspondent was informed by a workman's wife that her husband was one of those solely employed in the boring or auger business; but in Paris live worms are kept to do the work, and do it better and to order, which is more surprising. New oak can be stained by a solution of old iron in hot vinegar, which darkens it to a deeper tone; it is then carefully oiled and polished. The price demanded is such that bargains can be boasted of by the inexperienced, while really fine work always commands its value in the open market.

Any of the pieces of furniture which have to date from the sixteenth century are severely beaten with a heavy bludgeon, which serves to give them the worn appearance necessary to three centuries of existence. A common device is to paint the panels of cupboards, roughly carved on the premises, with white paint; they are then dried in the sun, and after keeping some months are washed in potash, which removes the paint in patches, and the exquisite finish of the carving beneath is apt to be taken for granted by the buyer, who is aware that in the last century much good paneling was thus painted and preserved to our generation in consequence in all its pristine freshness of cutting and outline. Buhl of a very ordinary description is ornamented by French dealers with brass scroll-work after the design of Gillott, who succeeded Buhl. In porcelain and faïence one can only say, "*Caveat emptor*," so clever are the tricks by which even the learned are deceived. At Cage's manufactory at Versailles the *faïence de Nevers* is reproduced to perfection; but here all is fair and open dealing. If the buyer prefers his purchase "antique," Mr. Cage will bake it for him until the glaze crackles; it is further mellowed in a manure heap, and a slight extra charge is imposed. The special marks of favorite potters are easily imitated, and as much pains is taken with the spurious ware with intent to deceive as would suffice to give value to real specimens. The character of the early decoration is carefully preserved, the even white of the Moustiers ware, the dead, dull white of the Marseilles and the careful finish of the old Delft potters.

At Venice the reproduction of the old palatial furniture is a thriving industry, and the same at Florence; but it possesses little or no artistic value. The ebony is black-stained wood; the *stipi* are bone, and not ivory; the shapes and patterns are carefully copied, and the prices are not excessive. Good patterns are a distinct gain in furniture; but the modern productions will not have the lasting qualities of the old. Ivory triptychs are manufactured at Versailles. The golden tint is gained by boiling in oil, then plunging into boiling water, and drying before a hot fire which cracks the ivory to perfection. These require a very skilled eye to detect, as the carving is often meritorious. Even works of the highest art do not escape the *truqueur*. Clodion, the late eminent French sculptor, discovered a group bearing his signature that had been sold for 4,500 francs. Legal proceedings were instituted accordingly. It was brought to light that the work in question was due to one Lebroc, who had made it his study to imitate Clodion. Nevertheless, three eminent judges,

Millet, Chapu and Guillaume, after careful examination and in spite of the signature, decided that in their opinion it was not the handling of Clodion. So the sales were annulled, and damages were not allowed by the courts. Clodion's real name was Michel and some of his earliest and finest works are thus signed. The famous *vernis Martin* can still be bought at Paris, very like the old, but still not genuine; and at present the secret of the real *Martin vernis* remains as impenetrable as ever.

In buying old oak furniture the buyer should notice the presence or absence of the "ties" or cross-bars near the floor, which are invariable in the construction of the seventeenth-century joiners. The forger is apt to forget this and thus himself brand the work as spurious. Decoration was formerly the proper art of a guild of Florentine artists in the fourteenth century. Painters, jewelers, engravers and metal-workers lived in a happy state of co-operative harmony, so that a coffer or casket might bear the successive impress of many clever hands, as the enamel, the setting, the lock, the jewel-work, would each be executed by an artist craftsman skilled as Dello, or Cellini, or Ghiberti. — *Lumber World.*

NOTES AND CLIPPINGS

Limewood for Carving. — The old Dutch carvers, of whom Grinling Gibbons was the acknowledged head, largely wrought in limewood, and, as this wood is not free from the attack of worms, a great part of this old work has been destroyed, or has had to undergo preservative processes, details of which will be found in T. A. Britton's "*A Treatise of Dry Rot in Timber.*"

Purgatory in a Cock Loft. — The old Dominican church at Nice, known as St. Dominic, is now used as a bakery for the French army. A few days ago, when the architect was employed to make some examination of the roof, he discovered in the garrets over 600 skeletons that had been flung in without order or arrangement. The medical experts declare they must have been buried in the church three or four centuries ago. When Nice was occupied by the French soldiers in 1792 the monks were driven out of the church, which was used for military purposes, and it is supposed that in making certain changes in the floor the skeletons were thrown up in the garrets. The majority of the bones are those of women, and among them there is no doubt the skeleton of a Duchess of Savoy, who was buried in the church. All the remains have since been buried in one of the cemeteries of Nice. — *Exchange.*

Increasing the Hardness of Bricks.— For obtaining products that will offer greater resistance to humidity, etc., than ordinarily is the case, an improved process of manufacturing bricks has been brought forward in Germany. After drying and grinding the clay, a mixture is made of 91½ parts of the latter, 3 parts of iron-filings, 2 of table salt, 1½ of potash, and 2 of elder or willow wood ashes. The whole is heated to a temperature varying from 3362° to 3632° Fahrenheit; at the end of from 4 to 5 hours the argillaceous mixture is run into molds, then rebaked in the ovens — always protected from the air — at a temperature of 842° to 932° Fahrenheit. The product may be variously colored by adding to the above quantity 2 parts of manganese for a violet-brown, 1 part of manganese for a violet, 1 part of copper ashes for a green, 1 part arsenite of cobalt for a blue, 2 parts of antimony for yellow, and 1½ parts arsenic and 1 part oxide of tin for white.— *Exchange.*

Some Facts about Redwood. — The producers of redwood lumber are just beginning to understand a fact in regard to the Eastern requirement that is of vital importance to them as far as building up a permanent trade with the East is concerned, which is that their lumber is sawed too thin. The mills in the redwood districts aim to saw just one inch in thickness. The allowance made for surfacing is three thirty-seconds of an inch for each cut, so when surfaced on two sides the lumber is three-sixteenths less than an inch, whereas, the rule in Chicago and other markets is that lumber, whether dressed on one or two sides, must be full seven-eighths of an inch thick. The reason why the thin lumber will not answer is that when used with other kinds of lumber it will not match. Moreover, in house-finish, some of it is to be dressed on one side and some on two; but the two are worked into the same job, and therefore redwood is not consistent with itself. The difficulty is the same with one and one-fourth inch and one and one-half inch; but two inch and over is all right, as the allowance made here is greater on the thick. Another thing the Westerners should understand is the penchant that consumers here have for bright and fresh-looking lumber. For that reason the pine wholesalers never dress their lumber until it is shipped. In California, however, lumber is dressed on one side as it comes from the saw: it is then piled and allowed to dry, and by the time it is ready to ship the old dressing makes a sharp contrast with a fresh surface, if the order happens to call for lumber dressed two sides. As finishing-lumber is used the best side out, and as either the old or freshly-dressed side may contain imperfections, the result is a variegated appearance which is not desirable In fact, the freshly-dressed surface determines the character of the stuff, whether good or cull, and the chance for selection is destroyed. In another point the green-dressed surface is at a disadvantage. In drying there is a more or less unequal shrinkage of the fibres, so that the grain of the wood is marked in little ridges, and the same result is reached as would be by poor surfacing. The evidence all goes to show that the redwood men should allow their lumber to dry before dressing. — *Northwestern Lumberman.*

An Obsidian Mountain.—One of the forthcoming reports of the Geological Survey will contain a paper by Professor Joseph P. Iddings upon an obsidian cliff in Yellowstone Park. This cliff is an elevation half a mile long by from 150 to 200 feet high, the material of which, Professor Iddings says, "is as good a glass as any artificially manufactured." Its colors and structure not only make it highly interesting to the visitor, but furnish to the scientific investigator phenomena of importance. The cliff presents part of a section of surface flow of obsidian, which poured down an ancient slope from the plateau lying east. It is impossible to determine what the original thickness of this flow was. The dense glass which now forms its lower portion is from 75 to 100 feet thick, while the porous and pumiceous upper portion has suffered from ages of erosion and glacial action. A remarkable feature of the cliff is the development of prismatic columns, which form its southern extremity. These are of shining black obsidian, rising from the talus slope, and are from 50 to 60 feet in height, with diameters varying from 2 to 4 feet. The color of the material of this cliff is, for the most part, jet black, but much of it is mottled and streaked with bright brownish-red and various shades of brown, from dark to light yellowish, purplish and olive green. The brilliant lustre of the rock and the strong contrasts of color with the black are very striking. In places the glass, in the process of cooling, has been broken into small angular pieces, which have been again cemented by the later flow, producing many colored and beautiful breccias. In some places the material shows a fine satin lustre, while in others a deep golden sheen is noticeable, which, under the lens, resolves itself into thin beams of red and yellow light. Through the black and red glass are scattered dull bluish-gray patches and bands, and round gray and pink masses, the effect of which is to still further vary the appearance and beauty of the rock, and make it the most conspicuous and characteristic variety of volcanic lava known.

TRADE SURVEYS

In almost every industry, and in every commercial channel, there is a marked increase in business, during this fourth quarter of the year, as far as it has gone, over the same time last year. The increase ranges from ten to twenty-five per cent. The improvement does not show itself very fully in the ordinary statistics relied upon. Yet there is a vast improvement in every direction. For several weeks this expanding volume of business was not followed by a corresponding improvement in prices. An improvement in this respect has at last set in. It was heralded by announcements in trade journals of advances before actual advances had taken place. The shrewder industrial managers early took alarm, and placed enormous orders for material, and thus laid the foundation for the present improvement. The full scope of the improvement is not apparent, because manufacturers, railroad-managers, and others are devoting most of their improving margins and not a little of new capital to the expansion of facilities of one kind or another, and of productive capacity. The railroad companies are especially following this policy. All of the trunk lines are making improvements, extensions, and additions of one kind or another. The Western and Southern railroad companies are spending more money in rails, lumber, cars, locomotives, terminal facilities and feeders than was ever expended in the same time before. The iron and steel makers are increasing their manufacturing capacity, but they did not begin this policy until after orders began to accumulate at a surprising rate. As compared to six months ago, prices are higher in all the great industries. On as much as one-fourth of our railway system freight-rates have been increased, not on all classes, however. Railway-managers contemplate a general increase of freight rates, as business expands. The textile manufacturers have permitted themselves to be led into large contracts for winter and spring delivery on the basis of low fall quotations, but most of them are now insisting upon an advance of from ten to twenty per cent on spring deliveries. Jobbers everywhere are quietly quoting higher prices, convinced that it is not only necessary from a mere business standpoint, but necessary in order to prevent a rushing in of orders of a speculative character. Consumers of all kinds of material for manufacturing, railroad, and building operations, are ready to take advantage of opportunities for covering spring and later requirements. The present advance has induced them to delay the placing of orders which would go very far to create a booming tendency in the market. This is one serious danger which we have just passed through, or rather, through which we are passing safely. Within six months from this time the producing-capacity of the country will have been largely increased in a variety of directions, and the necessity for an advance in prices will have been thereby largely overcome. During the past thirty days contracts have been placed for no less than one hundred thousand tons of steel rails, for immense supplies of brick, lath, shingles, lumber of all kinds, for cars, locomotive-engines, and stationary-engines of all degrees and capacity. For all kinds of building-material, builder's hardware, and for steam and electrical machinery. Meanwhile trade combinations have been perfected, manufacturers of machinery, of textile goods, of hardware, of pipes and tubes, of agricultural implements, and in some other branches, have come together and have perfected their trade organizations in the East and West by which their mutual interest can be more efficiently subserved. There is a scarcity of freight cars on most roads, and of coal cars on all of the lines largely handling that fuel. There is an upward tendency in prices which is stimulating confidence in trade and commerce. The development of industrial activity in the South shows no abatement. A presumably correct statement of the last nine months' progress in fourteen Southern States gives the investment of $84,000,000, in round numbers, in a multitude of small industries; besides this, large sums have been invested in railway construction. Our latest advices from Great Britain go to show that the worst is over. One leading iron-master said recently that it would not be very long before the demand for hematite ore would go beyond the capability of that country or any other. The industrial depression in Great Britain seems to be steadily dying out. Confidence is being reëstablished. This condition of things will react favorably upon the industries of the United States. The labor question will become less and less troublesome, notwithstanding the apprehensions of employers and that class of minds which do not recognize that labor has a right to think. The growth of power will be accompanied by a wiser use of it. Strikes will diminish in number, and lockouts will be resorted to only in the extremest cases.